

What is claimed is:

1. A sensory apparatus comprising:
a substrate comprising a plurality of sensors to obtain an analyte profile, the
sensors including an ion-selective sensor capable of measuring ion content and a
5 chlorine sensor capable of measuring chlorine content.
2. The apparatus of claim 1, further comprising an analyzer that corrects
the chlorine sensor measurement based on the analyte profile.
3. The apparatus of claim 1, wherein said ion-selective sensor is a
calcium ion sensor.
- 10 4. The apparatus of claim 1, wherein said ion-selective sensor is a
carbonate ion sensor.
5. The apparatus of claim 1, wherein said chlorine sensor is configured to
measure free chlorine and total chlorine.
- 15 6. The apparatus of claim 1, wherein said chlorine sensor is
amperometric.
7. The apparatus of claim 1, comprising a plurality of ion-selective
sensors, including a hydrogen ion sensor, a calcium ion sensor, a carbonate ion
sensor, and a bicarbonate ion sensor.
8. The apparatus of claim 2, wherein the substrate further comprises one
20 or both of a temperature sensor and a conductivity sensor.
9. The apparatus of claim 8, wherein said analyzer is configured to
analyze a signal from one or both of said temperature sensor and said conductivity
sensor to independently correct one or more other sensor measurements.

10. The apparatus of claim 1, wherein said substrate further comprises one or more of an ammonia sensor, an oxygen sensor, and an oxidation/reduction potential sensor.

5 11. The apparatus of claim 1, wherein said substrate comprises a silicon wafer upon which said sensors are formed, said substrate further comprises an external periphery, including a plurality of bond pads on said periphery electrically connected to circuitry inside said periphery.

10 12. The apparatus of claim 11, wherein said sensors and at least one bond pad are all on the same side of said substrate, and said substrate is physically and electrically connected to a lead frame, said lead frame having a plurality of sides and comprising

an opening through which said sensors are exposed for use;

at least one exposed conductor area aligned for electrical contact with said bond pad;

15 a plurality of electrical terminators, at least one electrical terminator disposed on the same side of said lead frame as said exposed conductor area and electrically connected to said exposed conductor area.

13. A sensory apparatus comprising:

20 a substrate comprising a plurality of sensors to obtain an analyte profile, the sensors including an ion-selective sensor capable of measuring calcium ion content and a chlorine sensor capable of measuring chlorine content.

14. A sensory apparatus comprising:

25 a substrate comprising a plurality of sensors to obtain an analyte profile, the sensors including an ion-selective sensor capable of measuring carbonate ion content and a chlorine sensor capable of measuring chlorine content.

15. An apparatus for analyzing water quality, comprising: a plurality of ion-selective sensors for measuring ion content of the water, each ion-selective sensor including a sensor element comprising an electrode and an ion-selective

membrane on a substrate; an amperometric chlorine sensor, the chlorine sensor including a sensor element comprising a working electrode and a counter electrode on said substrate; and an analyzer unit connected to the sensor elements, wherein the sensor elements transmit signals to the analyzer and wherein the analyzer calculates an analyte profile based on said signals.

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16. A sensory apparatus comprising:
a substrate comprising a plurality of sensors, including
a chlorine sensor;
a pH sensor;
a calcium ion sensor;
a carbonate ion sensor; and
a bicarbonate ion sensor.

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17. The apparatus of claim 16, wherein said free chlorine sensor comprises an amperometric sensor comprising a reference electrode disposed on or off of the substrate; said pH, calcium ion, and carbonate ion sensors each comprise an ion selective electrode; and said bicarbonate ion sensor is a differential pCO₂ sensor comprising an unbuffered pH-sensitive electrode sensor and a buffered pH-selective electrode sensor, said buffered pH-selective electrode sensor of said differential pCO₂ sensor being the same or different as the ion selective electrode comprising said pH sensor.

18. A method of generating a disinfection index of water, comprising measuring, directly or indirectly, properties including free chlorine concentration, pH, calcium ion concentration, carbonate ion concentration, and bicarbonate ion concentration, concurrently on a contiguous sample of water.

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19. The method of claim 18, wherein said method further comprises weighting one or more of said pH, calcium ion, carbonate ion, and bicarbonate ion concentrations by an empirical factor and calculating a disinfection index as the product of said concentrations.

20. The method of claim 18, further comprising calculating free chlorine species concentrations as a function of pH, weighting one or more of said calcium ion, carbonate ion, bicarbonate ion, and free chlorine species concentrations by an empirical factor; and calculating a disinfection index as the sum of the products of each of said free chlorine species with the remainder of said concentrations.

21. The method of claim 18, further comprising repeating the method in series or parallel and averaging two or more disinfection indices.

22. The method of claim 20, further comprising measuring temperature and applying a kinetic coefficient correction to one or more of said measured properties.

23. The method of claim 22, further comprising measuring conductivity and applying an activity coefficient correction to one or more of said measured properties.